

S P E C I F I C A T I O N

CANOPY RELEASE BUCKLE WITH DUAL ACTION RELEASE LEVER

BACKGROUND OF THE INVENTION

The field of the invention is harness assemblies and the invention relates more particularly to buckle systems for releasing one portion of a harness assembly from another portion. One critical type of buckle is used to release a parachute canopy harness from the portion of the harness worn by a member of the crew of an aircraft.

U.S. Patent No. 5,857,247 shows a particular style of harness assigned to the assignee of the present invention. The '247 patent is incorporated herein by reference for purposes of background and the harness shown in the '247 patent releases the parachute only when a lever is moved in a single direction. For some applications, it is beneficial that the lever release a parachute harness when moved either in a forward direction or a rearward direction.

BRIEF SUMMARY OF THE INVENTION

The present invention is for a dual action canopy release for releasably holding a parachute harness securement strap in a buckle. The canopy release may be activated by a forward movement of a lever arm or a rearward movement of the lever arm. The

1 lever arm cooperates with an actuating lever having a first position, wherein the
2 actuating lever holds a latch in a locked position, and a second position, wherein the
3 actuating lever releases the latch thereby allowing the latch to move to an unlocked
4 position. Either the forward movement or the rearward movement of the lever arm
5 causes the actuating lever to move to the second position. In the unlocked position, the
6 latch allows parachute harness securement strap to be withdrawn from the buckle.
7 Thus, the dual action canopy release releases a parachute harness when the lever arm
8 is moved either in a forward direction or a rearward direction.

9 In accordance with one aspect of the invention, there is provided a buckle having
10 a frame with a forward end and a rearward end, which buckle supports a latch which
11 may be pivoted between a locked counter clockwise position and a released clockwise
12 position. The latch is biased in a released clockwise position, but is held in a locked
13 counter clockwise position by contact with a latch holding ledge supported by an
14 actuating lever. The actuating lever has a distal end and a pivot end and the actuating
15 lever is pivotable between a latch holding clockwise position and a latch releasing
16 counter clockwise position. The actuating lever is biased toward the latch holding
17 clockwise position. A lever arm is pivotally held by a lever arm pivot pin on the distal
18 end of the actuating lever and extends upwardly therefrom. The lever arm has a distal,
19 finger-contacting end and a pivot end.

20 When the distal finger-contacting end of said lever arm is moved rearwardly, the
21 lever arm contacts a contacting end of said actuating lever and pulls the distal end of

1 the actuating lever so that the actuating lever rotates in a counter clockwise direction to
2 the latch releasing counter clockwise position.

3 The lever arm includes a forward facing surface between the pivot end and the
4 distal finger-contacting end. A contacting member is secured to the frame and
5 positioned so that a rearward edge of the contacting member is aligned with the forward
6 facing surface of the lever arm. In this manner, when the distal, finger-contacting end
7 of the lever arm is moved forwardly, the forward facing surface contacts the contacting
8 member and lifts the lever arm pivot pin, thereby rotating said actuating lever in a
9 counter clockwise direction to the latch releasing counter clockwise position. Thus, the
10 buckle opens whether the lever arm is moved in a forward direction or a rearward
11 direction.

12 13 **BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING**

14 Figure 1 is a cross-sectional side view of the dual action canopy release buckle
15 of the present invention.

16 Figure 1A is a detailed view of the actuating lever of the dual action canopy
17 release buckle.

18 Figure 1B is a detailed view of the lever arm of the dual action canopy release
19 buckle.

20 Figure 1C is a detailed view of the latch of the dual action canopy release buckle.

1 Figure 1D is a detailed view of the contacting member of the dual action canopy
2 release buckle.

3 Figure 2 is a perspective view, partly in cross-section, of the buckle of Figure 1.

4 Figure 3 is a perspective view, partially cut away, of the buckle arm of Figure 1.

5 Figure 4 is a perspective view, partially cut away, of the buckle of Figure 1.

6 Figure 5 is a cross-sectional view of the buckle of Figure 1 in a latched
7 configuration.

8 Figure 6 is a cross-sectional view of the buckle of Figure 1 with the lever arm in a
9 partially forward position.

10 Figure 7 is a cross-sectional view of the buckle of Figure 1 with the lever arm in a
11 fully forward position.

12 Figure 8 is a cross-sectional view of the buckle of Figure 1 in a latched
13 configuration.

14 Figure 9 is a cross-sectional view of the buckle of Figure 8 with the lever arm in a
15 partially rearward position.

16 Figure 10 is a cross-sectional view of the buckle of Figure 8 with the lever arm in
17 a fully rearward position.

18 Figure 11 is a cross-sectional view of an embodiment of the present invention
19 which includes a activating slide.

DETAILED DESCRIPTION OF THE INVENTION

The buckle of the present invention is shown in a cross-sectional side view in Figure 1 and indicated generally by reference character 10. Buckle 10 has a frame 11 which pivotally supports an actuating lever 12 by an actuating lever pivot pin 13 held by frame 11. Actuating lever 12 has a pivot end 14 and a distal end 15. Actuating lever 12 is biased in a clockwise direction as indicated by first arrow 17. Latch 16 is biased in a clockwise direction as indicated by second arrow 18.

Actuating lever 12 supports a lever arm 19 by a lever arm pivot pin 20 positioned adjacent the distal end 15 of actuating lever 12. Lever arm 19 has a distal, finger-contacting end 21 (also called an actuating end) and a pivot end 22 (see Figure 1B). Lever arm 19 also has a forward facing surface 23 (see FIG. 1B) which contacts contacting member 24 when lever arm 19 is moved in a forward direction indicated by arrow 25 and described in more detail below. In a manner analogous to the action of the buckle shown in U.S. Patent No. 5,857,247, the buckle has a passageway 26 for insertion of a parachute strap holding tang not shown. This tang contacts tang tooth 27 which is lowered as latch 16 is moved in a clockwise direction about pivot pin 28. When the distal, finger-contacting end of lever arm 21 is moved in a rearward direction as indicated by arrow 29, the contacting end 30 (see Figure 3) of actuating lever 12 prevents the lever arm 19 from pivoting about pivot pin 20 and instead, causes the actuating lever 12 to move in a counter clockwise direction as shown in Figure 1 about actuating lever pivot pin 13.

1 Frame 11 has an opening 31 to hold a harness loop affixed to the air crew
2 member. This opening is formed at the rearward end 32 of frame 11.

3 Figure 1A is a detailed view of the actuating lever 12 of the dual action canopy
4 release buckle 10. The actuating lever 12 defines a latch holding ledge arm portion 36,
5 a pivot end of actuating lever 14, and a latch holding ledge 12' formed in actuating lever
6 12 and prevents latch 16 from pivoting into an unlocked position.

7 Figure 1B is a detailed view of the lever arm 19 of the dual action canopy release
8 buckle 10. The lever arm 19 defines a finger contacting end 21 of lever arm 19, a pivot
9 end 22 of lever arm 19, a forward facing surface 23 of lever arm 19, and a lever arm
10 pivot pin 20.

11 Figure 1C is a detailed view of the latch 16 of the dual action canopy release
12 buckle 10. The latch defines a tang tooth 27.

13 Figure 1D is a detailed view of the contacting member 24 of the dual action
14 canopy release buckle 10. A rearward edge 24' of the contacting member 24 contacts
15 the forward facing surface 23 of the lever arm 19.

16 Further details of construction are shown in the views of Figures 2 and 3. There
17 it can be seen that lever arm 19 supports a finger-contacting bar 33 in a bridging
18 manner. It also can be seen that actuating lever 12 has a cross-arm portion 34 which
19 supports a downwardly extending arm 35, which in turn contacts contacting member 24.
20 Also, the latch holding ledge arm portion 36 of actuating lever 12 is shown clearly in
21 Figure 2.

1 Figure 3 shows the detail of the contact between the lever arm 19 and the
2 contacting end 30 of actuating lever 12. The contacting end 30 of the actuating lever
3 12 resides adjacent to a portion of the lever arm 19 between the pivot end 22 and the
4 finger contacting end 21.

5 Figure 4 shows the contact between the forward facing surface 23 of lever arm
6 19 and the rearward edge 24' of the contacting member 24. It is also evident from
7 Figure 4 that the forward movement 25 of the lever arm 19 will cause surface 23 to
8 contact the rearward edge 24' of the contacting member 24 and cause actuating lever
9 12 to rotate in a clockwise direction 40, as viewed in Figure 4. Of course, the terms
10 "clockwise" and "counter clockwise" are used only to describe a particular view and will
11 vary depending on which side of the buckle is being viewed. The claims using those
12 terms are not intended to be limiting.

13 The action of the buckle is shown perhaps most clearly in Figures 5-10. Figure 5
14 shows the buckle in a latched configuration. As the distal finger-contacting end 21 of
15 lever arm 19 is moved in a forward direction 25, as shown in Figure 6, the forward
16 facing surface 23 of lever arm 19 contacts the rearward edge 24' of the contacting
17 member 24. This causes lever arm pivot pin 20 to rise, thereby rotating actuating lever
18 12 in a counter clockwise direction. This causes the latch holding ledge 12' to begin to
19 release latch 16. As shown in Figure 7, as the distal finger-contacting end 21 of lever
20 arm 19 is moved to a fully forward position, the latch holding ledge 12' has released

1 latch 16 and permitted it to move in a clockwise direction and lowered tang tooth 27,
2 which releases the hold on the parachute canopy strap assembly.

3 Figure 8, once again as in Figure 5, shows the buckle in a latched configuration.
4 As the distal finger-contacting end 21 of lever arm 19 is moved rearwardly 29, as shown
5 in Figure 9, lever arm 19 contacts the contacting end 30 of actuating lever 12. This
6 causes the lever arm 19 and the actuating lever 12 to act as a single unit and to pivot in
7 a counter clockwise direction about pivot pin 13. As shown in Figures 9 and 10, this
8 causes the latch holding ledge 12' to release the latch 16 and once again permit it to
9 move in a clockwise direction, releasing the parachute canopy harness assembly.

10 Another embodiment of the present invention includes an actuating slide 52
11 shown in FIG. 11. The actuating slide 52 has a first slide position wherein the actuating
12 slide 52 holds the latch 16 in the locked position, and the actuating slide 52 has a
13 second slide position wherein the actuating slide 52 releases the latch 16 thereby
14 allowing the latch 16 to move to the unlocked position. The a first slide arrow 54
15 indicates the direction the actuating slide 52 is moved in to place the actuating slide 52
16 in the first slide position, and the second slide arrow 56 indicates the direction the
17 actuating slide 52 is moved in to place the actuating slide 52 in the second slide
18 position. The actuating slide 52 is preferably biased in the first slide position by springs
19 58. The result is a latch assembly which may be operated by moving the end of the
20 lever arm in either direction.

1 Further to the buckle described above, the present invention contemplates
2 any dual action release buckle comprising a frame, a latch moveably connected to the
3 frame and adapted for releasably holding a tang in the buckle, an actuating member
4 (for example, the actuating lever described above) moveably connected to the frame
5 and mechanically cooperating with the latch, a moveable lever arm having a lever arm
6 actuating end (also called a finger-contacting end) and a lever arm pivot end pivotally
7 coupled to the actuating member, a contacting end of the actuating member residing
8 proximal to the lever arm, and a contacting member fixedly connected to the frame and
9 proximal to a side of the lever arm opposite the actuating member and between the
10 actuating end and the distal end. The latch having a locked position wherein the tang is
11 held, and an unlocked position wherein the tang is released. The actuating member
12 having a first position, wherein the latch is held in the locked position, and a second
13 position, wherein the latch is free to move to the unlocked position. The actuating
14 member may be pivotally coupled to the frame by an actuating lever pivot pin, or the
15 actuating member may be a sliding member slideably coupled to the frame, and may
16 further be biased into the first position.

17 The present invention is further intended to contemplate any buckle including an
18 actuating member adapted to directly couple a motion of the lever arm in a first
19 direction into a motion of the actuating member from the first position to the second
20 position and to indirectly couple a motion of the lever arm in a second direction into a
21 motion of the actuating member from the first position to the second position. Any

1 actuating member structure wherein motion of the lever arm towards the actuating
2 member is limited in a manner in which the motion of the lever arm is directly coupled
3 into a motion of the actuating member, is intended to come within the scope of the
4 present invention. Additionally, any contacting member structure wherein cooperation
5 of a contacting member with a lever arm, wherein motion of the lever arm actuating end
6 in a second direction is inversely coupled to the actuating member, is intended to come
7 within the scope of the present invention. The actuating end of the lever arm may
8 comprise a finger-contacting end adapted for manual manipulation, and preferable
9 requires between approximately two pounds force to approximately fifteen pounds force
10 to move the actuating member from the first position to the second position.

11 The present embodiments of this invention are thus to be considered in all
12 respects as illustrative and not restrictive; the scope of the invention being indicated by
13 the appended claims rather than by the foregoing description. All changes which come
14 within the meaning and range of equivalency of the claims are intended to be embraced
15 therein.